voltage spike, or the like, and send an alert to the management/data acquisition unit **1912**.

[0085] The thermionic layer **103** of FIG. **1** will now be described in further detail with reference to FIGS. **22**A and **22**B. Referring to FIG. **22**A, the thermionic layer **103** comprises thermionic material **2201**. As will be understood by those of ordinary skill in the art, thermionic materials collect ambient thermal energy and convert the collected thermal energy into electrical energy. Preferably, a parallel plate discharge capacitor **2202** is formed within the thermionic layer **103** in order to store electrical energy converted from ambient thermal energy. Advantageously, even small amounts of such converted energy can be stored in the parallel plate discharge capacitor and transferred to the battery layer **102** once a threshold charge is reached in the capacitor. Because the thermionic material forms part of the parallel plate capacitor, the accumulated charge is not dissipated by impedance losses caused by transferring the charge over a conductor to a remote storage unit or load. The parallel plate discharge capacitor **2202** accumulates the converted electrical energy over a period of time such that the total accumulated electric charge reaches a level suitable for transferring charges to the battery module **102** for more permanent storage. A control/switching mechanism is preferably included in the thermionic layer to control the level of the electric charges accumulated on the parallel discharge capacitor that may trigger the transferring of the electric charges to the battery module.

[0086] The parallel plate capacitor **2202** formed in the thermionic layer **103** comprises a positive electrode **2203**, a negative electrode **2204** and a dielectric **2205**. As discussed above in connection with FIG. **1**, the thermionic layer **103** may be formed between the PV layer **104** and the battery layer **102**, or alternately, inside the battery layer **102**. In other words, the thermionic layer **103** may also be formed between the substrate **101** and the battery layer **102**. FIG. **22**A illustrates the thermionic layer **103** formed between the PV layer **104** and the battery layer **102**. FIG. **22**B illustrates the thermionic layer **103** formed between the battery **102** and the substrate **101**.

[0087] In a preferred embodiment, the parallel plate discharge capacitor **2202** is formed of two deposited thin-film graphite layers around a dielectric layer that is preferably a thin-film deposited active carbon layer. One of the thin-film graphite layers is preferably deposited onto thermionic material **2201**. A preferred thermionic material is strontium titanate, but those of ordinary skill in the art will recognize that any suitable thermionic material could be used. Charges generated by the thermionic layer **2201** accumulate on the adjacent thin-film graphite layer **2203**, which is one of the electrodes of the parallel plate capacitor **2202**.

[0088] Referring back to FIG. **6**, because devices **100** are installed on highway jersey walls, it is foreseeable that the devices may be struck by vehicles in vehicle accidents. As discussed above, the tube portion **106** of device **100** is preferably designed to breakaway from the base **107** upon a heavy impact, so that distribution conductors **501** remain safely embedded in the mounting clip **300**. However, another safety concern in a vehicle accident is the breakaway tube portion **106** becoming a projectile. Accordingly, applicant has invented a novel safety feature designed to work with the device **100**. FIG. **23** illustrates a safety tether **2301** incorporated into device **100**. Safety tether **2301** is preferably a flexible steel cable that runs through the hollow tube portion of device **100**. Safety tether **2301** is fastened to the infrastructure **601**. Accordingly, if a vehicle strikes device **100** with enough force to cause the tube portion of device **100** to breakaway from the base **107**, the safety tether **2301** will retain the tube portion **106** of the device **100** in close proximity to the infrastructure **601**. Accordingly, the tube portion of device **100** advantageously does not become a dangerous projectile. Safety tether **2301** can be strung through an individual device **100**, or alternately can be strung through any number of adjacent devices **100**. Safety tether **2301** can be fastened to the infrastructure **601** at both ends, or alternately can be fastened to the infrastructure **601** at one end, and to the device **100** at the other end.

[0089] A system according to an exemplary embodiment of the present invention will now be described in further detail in connection with FIG. **24**. As shown in FIG. **24**, a system of devices **100**-*a*, **100***b*, can span large distances along existing highway infrastructure. The energy accumulated in one device **100** can easily be transferred to an adjacent device **100**. Accordingly, through the system, known disadvantages of conventional solar energy systems are overcome. First, the geographic disparity of devices **100**-*a* and **100**-*b* increases the likelihood that sunshine is generating energy in one part of the system (**100**-*a*) even if inclement weather prevents significant energy generation in another part of the system (**100**-*b*). Similarly, the daily service time of the system is increased when one portion of the system (**100**-*a*) is in a different time zone than a second portion of the system (**100**-*b*). The modular energy storage **102** included in each device **100** allows the system to continue providing energy long after the sun has set on the entire system. Because storage **102** is advantageously included in each modular, autonomous device **100**, the storage of the system naturally scales with the system. In addition, the curved nature of the devices **100** allows more sources of light to provide energy to the system. For example, indirect light received from any source, including car headlamps, overhead highway lighting, the stars, the moon, and so on, provide energy to the system. Heat from the highway activates the thermionic layer **103** of the devices **100**. Accordingly, portions of the system in hot sunny climates such as the Arizona desert will have the advantage of generating energy from strong sunlight and immense heat generated by the blacktop highway. Furthermore, the PV layer **104** is preferably formed with materials such as amorphous silicon which are more efficient in converting photonic energy to electrical energy. Accordingly, the use of advanced materials in the device further enhances the efficiencies gained from the curved shape of the devices **100**.

[0090] An assembled battery core **1500** portion of a device **100** according to an embodiment of the present invention can be made easily removable from the hollow tube portion of the device **100** (which includes the outer layer **105**, the PV layer **104** and the thermionic layer **103**). The assembled battery core **1500** can be used in a variety of applications, some of which will now be described.

[0091] As shown in FIG. **25**, an assembled battery core **1500** is adapted to be received in a host device **2501**. Battery core **1500** includes two electrodes **2502** and **2503**. Host device **2501** includes electrodes **2502**-*a* and **2503**-*a*. Electrodes **2502** and **2503** are preferably slidably engageable with electrodes **2502**-*a* and **2503**-*a* when battery core **1500** is fully inserted into host device **2501**.

[0092] FIG. **26** illustrates and exemplary application of the battery core **1500** with a host device. Vending machine **2601** includes receiving ports **2602** that are each adapted to receive